Claims:

1. An optical switch, comprising:

a plurality of transmitting devices integrated on a single substrate, each of an individual transmitting device including a directing device;

a plurality of receiving devices,

wherein at least a portion of the transmitting devices direct output beams from the plurality of transmitting devices to the plurality of receiving devices.

2. The switch of claim 1, wherein the plurality of transmitting devices are integrated on a single substrate in a batch process.

3. The switch of claim 1, wherein the plurality of transmitting devices includes a plurality of focusing devices, each of an optical fiber from the plurality of transmitting devices being coupled to at least one focusing device.

4. The switch of claim 1, wherein the plurality of transmitting devices includes a plurality of directing devices, each of an optical fiber of the plurality of transmitting devices being coupled to at least one directing device.

5. The switch of claim 1, wherein the plurality of transmitting devices includes a plurality of focusing devices and a plurality of directing devices, wherein each of a focusing device is coupled to a directing device.

6. The switch of claim 3, wherein each focusing device includes at least one lens.

7. The switch of claim 5, wherein each lens is selected from a regular lens, a GRIN lens, a diffractive grated lens, and a Fresnel lens.

8. The switch of claim 3, wherein at least a portion of the focusing devices include a micro-collimator.

9. The switch of claim 3, wherein at least a portion of the focusing devices include an optical waveguide.

10. The switch of claim 3, wherein at least a portion of the focusing devices include a variable-focus lens.

11. The switch of claim 4, wherein each directing device is a micro-mechanical device.

12. The switch of claim 4, wherein at least a portion of the directing devices include an optical waveguide.

13. The switch of claim 11, wherein each micro-mechanical device includes an actuator.

14. The switch of claim 13, wherein each actuator is selected from an electro-static actuator, an electromagnetic actuator, a piezoelectric actuator, a thermo-mechanical actuator and a polymer actuator.

15. The switch of claim 14, wherein the polymer actuator is an electro-active polymer actuator, an optical-active polymer actuator, a chemically active polymer actuator, a magneto-active polymer actuator, an acousto-active polymer actuator and a thermally active polymer actuator.

16. The switch of claim 11, wherein each micro-mechanical device includes a suspension member that provides movement of a distal portion of an optical fiber of the plurality of transmitting optical fibers.

17. The switch of claim 16, wherein each suspension member includes at least one elastic deformation member that provides a mechanical coupling between a substrate and the movable part of the directing device.

18. The switch of claim 3, further comprising:

an optical body positioned between each focusing device and a distal end of each of a optical fiber of the plurality of transmitting optical fibers.

19. The switch of claim 18, wherein the optical body includes at least one of a solid optical transparent material, a liquid optically transparent material, a gaseous optically transparent material, a gel optically transparent material.

20. The switch of claim 1, wherein at least a portion of the receiving devices are directed to receive the transmitter output beams from the plurality of transmitting devices while simultaneously focusing the incoming beams into the plurality of optical fibers of the plurality of receiving devices.

21. The switch of claim 1, wherein the plurality of receiving devices includes a plurality of focusing devices, each of an optical fiber of a plurality of receiving optical devices being coupled to at least one focusing device.

22. The switch of claim 1, wherein the plurality of receiving devices includes a plurality of directing devices, each of an optical fiber of a plurality of receiving optical devices being coupled to at least one directing device.

23. The switch of claim 1, wherein the plurality of receiving devices includes a plurality of focusing devices and a plurality of directing devices, wherein each of a focusing device is coupled to a directing device.

24. The switch of claim 21, wherein each focusing device includes at least one lens.

25. The switch of claim 21, wherein at least a portion of focusing devices include a micro-collimator.

26. The switch of claim 21, wherein at least a portion of the focusing devices include an optical waveguide.

27. The switch of claim 21, wherein at least a portion of focusing devices include a variable-focus lenses.

28. The switch of claim 24, wherein each lens is selected from a regular lens, a GRIN lens, a diffractive grated lens, and a Fresnel lens.

29. The switch of claim 22, wherein each directing device is an micro-mechanical device.

30. The switch of claim 22, wherein at least a portion of the directing devices include an optical waveguide.

31. The switch of claim 29, wherein each micro-mechanical device includes an actuator.

32. The switch of claim 31, wherein each actuator is selected from an electro-static actuator, an electromagnetic actuator, a piezoelectric actuator, a thermo-mechanical actuator and a polymer actuator.

33. The switch of claim 32, wherein the polymer actuator is an electro-active polymer actuator, an optical-active polymer actuator, a chemically active polymer actuator, a magneto-active polymer actuator, an acousto-active polymer actuator and a thermally active polymer actuator.

34. The switch of claim 29, wherein each micro-mechanical device includes a suspension member that provides movement of a distal portion of a transmitting optical fiber of the plurality of transmitting optical fibers.

35. The switch of claim 34, wherein each suspension member includes at least one elastic deformation member that

provides a mechanical coupling between a substrate and at least a portion of each micro-mechanical device.

36. The switch of claim 21, further comprising:

an optical body positioned between each focusing device and a distal end of each optical fiber of the plurality of receiving devices. .

37. The switch of claim 36, wherein the optical body includes at least one of a solid optical transparent material, a liquid optically transparent material, a gaseous optically transparent material, a gel optically transparent material.

38. The switch of claim 1, wherein at least a portion of transmitting devices are MEMS devices.

39. The switch of claim 3, wherein at least a portion of focusing devices are MEMS devices.

40. The switch of claim 4, wherein at least a portion of directing devices are MEMS devices.

41. The switch of claim 21, wherein at least a portion of focusing devices are MEMS devices.

42. The switch of claim 22, wherein at least a portion of directing devices are MEMS devices.

43. The switch of claim 24, wherein at least a portion of lenses are MEMS devices.

44. The switch of claim 1, wherein each of a transmitting device includes a fiber placement cavity.

45. The switch of claim 1, further comprising at least one transmitter substrate with a plurality of fiber placement cavities, each of a fiber placement cavity corresponding to a transmitting device of the plurality of transmitting devices.

46. The switch of claim 45, further comprising at least one receiver substrate with a plurality of fiber placement cavities, each of a fiber placement cavity corresponding to a receiving device of the plurality of receiving devices.

47. The switch of claim 46, wherein each of a transmitter device includes a focusing device and a directing device positioned adjacent to a fiber placement cavity.

48. The switch of claim 47, wherein each of a receiver device includes a focusing device and a directing device positioned adjacent to a fiber placement cavity.

49. The switch of claim 45, wherein each of a transmitter device includes a focusing device and a directing device at least partially positioned in a fiber placement cavity.

50. The switch of claim 49, wherein each of a receiver device includes a focusing devices and a directing device at least partially positioned in a fiber placement cavity.

51. The switch of claim 48, wherein each directing device includes a suspension member that provides movement of a distal portion of a transmitting or receiving optical fiber.

52. The switch of claim 50, wherein each directing device includes a suspension member that provides movement of a distal portion of a transmitting or receiving optical fiber.

53. The switch of claim 1, further comprising:

a first substrate coupled to the plurality of transmitting devices that include a plurality of transmitting optical fibers, a plurality of focusing members and a plurality of directing members;

a second substrate coupled to the plurality of receiving devices that include a plurality of receiving optical fibers, a

plurality of focusing members and a plurality of directing members.

54. The switch of claim 53, wherein at least a portion of the receiving devices are directed to receive the transmitter output beams from the plurality of transmitting devices while simultaneously focusing the incoming beams into the plurality of optical fibers of the plurality of receiving devices.

55. The switch of claim 53, wherein the first and second substrates each include a plurality of fiber placement cavities. .

56. The switch of claim 55, wherein a cross-sectional dimension of a fiber placement cavity is greater than the size of the components positioned in the cavity. .

57. The switch of claim 53, wherein the plurality of transmitting devices includes a plurality of elastic deformation members that provide a mechanical coupling between the first substrate and a movable parts of directing devices.

58. The switch of claim 53, wherein the plurality of receiving devices includes a plurality of elastic deformation members that provide a mechanical coupling between the second substrate and a movable parts of directing devices.

59. The switch of claim 1, further comprising

an optically transparent media between transmitting and receiving devices where light beams from said transmitting devices can mutually intersect on their way to corresponding receiving devices.

60. The switch of claim 59, wherein the optically transparent media includes a vacuum, a solid optically transparent material, a liquid optically transparent material, a

gaseous optically transparent material, a gel optically transparent material.

61. The switch of claim 59, wherein optically transparent media is a system of lenses between transmitting and receiving devices.

62. The switch of claim 61, wherein each lens is selected from a regular lens, a GRIN lens, a diffractive grated lens, and a Fresnel lens.

63. The switch of claim 1, wherein a number of transmitting devices and a number of receiving devices are the same.

64. The switch of claim 1, further comprising:

a control system coupled to the plurality of transmitting devices and plurality of receiving devices, the control system providing control signals that coordinate positioning of transmitting devices and receiving devices.

65. The switch of claim 1, further comprising:

at least one sensor coupled to the plurality of transmitting devices and the control system; and

at least one sensor coupled to the plurality of receiving devices and the control system.

66. The switch of claim 65, wherein each of the plurality of transmitting and receiving devices includes at least one photosensitive sensor.

67. A method for optical switching between input fiber channels output fiber channels comprising:

providing a plurality of transmitting devices including a plurality of optical fibers and a plurality of receiving devices

including a plurality of optical fibers, the plurality of transmitting devices being integrated on a single substrate; and

focusing and directing at least a portion of the transmitter output beams from the plurality of transmitting devices to the plurality of receiving devices.